REMARKS

Claims 9-10, 13-14 and 29-32 are now in this application.

By this amendment, claims 17-28 have been canceled from this application, since they are being prosecuted in a divisional application.

The language of claims 9-10, 13-14 and 29-32 has not been revised, but are submitted in the present list of claims so that the present list of claims can properly list that claims 17-28 have been canceled.

Claim rejections under 35 USC 112

In paragraphs 2 and 4 the examiner has objected to the specification and rejected claims 29-32, indicating that there is no support in the original disclosure for, and that therefor the following 4 recitations from claims 29-32, constitute new matter. In addition to paraphrasing the examiner's indication of new matter, the following section of this amendment adds where it is believed that the original disclosure provides support for each of these recitations:

1. "The coating of the piezoelectric stack has to be done before sintering," claim 29.

    1a. In paragraph 11, the specification recites, "during the green state of the piezoelectric actuator, i.e. before the sintering, the insulating layer is applied to the entire outside of the piezoelectric actuator." "A suitable process for this is the so-called dip immersion process."

1b. In paragraph 13, the specification recites, "... then the subsequent sintering produces a very tight"

2. "The material used as a coating becomes hard, smooth and impervious", claim 30.

2a. In paragraph 13, the specification recites, "then the subsequent sintering produces a very tight, integral bond between the ceramic of the sheet laminations of the piezoelectric layers and the outer insulating layer; this ceramic layer constitutes an effective protective sleeve around the actuator. With closed porosity, which is usually the case with the piezoelectric ceramic used, the ceramic layer is quite impermeable to moisture".

While this support for item 2 is not explicit for the coating being hard and smooth, it is believed to be **always the case** that sintered ceramic is hard, and that sintered ceramic material such as used in piezoelectric devices is smooth. Thus it is believed that the hard and smooth properties are intrinsic to the materials and methods of forming them as used in the disclosure.

3. "Hardening and removing portions of the sintered coating", claim 31.

3a. In paragraph 10, the specification recites, "After the piezoelectric actuator is sintered, the regions in which the outer electrodes are contacted and possibly also the end surfaces are uncovered, for example by means of grinding or etching."

3b. In paragraph 20, the specification recites, "Figs. 4 and 5 each show a cross section through a piezoelectric actuator after sintering, one before and one after the uncovering of the outer electrode regions of the piezoelectric actuator,"

3c. In paragraph 27, the specification recites, "Fig. 5 shows the state after the sintering of the piezoelectric actuator 10. Here, regions 16 and 17 to be contacted by the outer electrodes 11 are uncovered by grinding or etching, thus producing the insulating layers 12 and 13."

3d. Original claim 4 states, "the outer electrodes (5, 6; 11) are attached to regions of the insulating material that have been uncovered by grinding."

3e. Original claim 5 states "in a first process step, in the green state of the piezoelectric actuator (10) before the sintering, the insulating layer (12, 13) is applied to all of the external surfaces of the piezoelectric actuator (10) and - after the sintering of the piezoelectric actuator (10), the regions (16, 17) in which the outer electrodes (5, 6; 11) are contacted, are uncovered."

3f. Original claim 7 states "the regions (16, 17) that are contacted by the outer electrodes (5, 6; 11) are uncovered by means of grinding."

3g. Original claim 8 states "the regions (16, 17) that are contacted by the outer electrodes (5, 6; 11) are uncovered by means of etching."

4. "Adding outer electrodes to the area which has had the coating removed", claim 32.

4a. In paragraph 10, the specification recites, "the outer electrodes can easily be

attached to regions in which the insulating material has been ground away."

4b. In paragraph 27, the specification recites, "Fig. 5 shows the state after the sintering of the piezoelectric actuator 10. Here, regions 16 and 17 to be contacted by the outer electrodes 11 are uncovered by grinding or etching, thus producing the insulating layers 12 and 13."

Thus it is believed to be clear that the examiner's characterization that the claimed recitations of:

1. "The coating of the piezoelectric stack has to be done before sintering," claim 29,

2. "The material used as a coating becomes hard, smooth and impervious", claim 30,

3. "Hardening and removing portions of the sintered coating", claim 31, and

4. "Adding outer electrodes to the area which has had the coating removed", claim 32.

as being new matter is not warranted.

The Prior Art Rejection

The examiner rejected apparatus claims 9-10, 13-14 and 29-32 as anticipated by Schreiner et al.

Applicant does not agree with this rejection for the following reasons.

From the Schreiner et al. reference, a piezoelectric actuator that is provided with an insulating coating is indeed known; the insulating coating is a so-called sintered skin. This skin of Schreiner et al. is created as part of the sintering process, but it is formed from the material of the piezoelectric layers of the stack. The reference to Schreiner et al. has no indication

whatsoever that an additional insulating layer is applied to the stack while the piezoelectric stack is in its green state, before sintering, as is recited in claim 9. The disclosure of Schreiner et al. never states that such a layer is added to the stack.

In the absence of any disclosure of such a layer being added to the stack and then the composite stack and its coating is sintered, the reference to Schreiner et al. has structure which is different from the structure which is recited in the claims of this application.

With no disclosure in Schreiner et al. of such an insulation layer being added, the skin of Schreiner et al. must be formed from the piezoelectric layers of Schreiner et al. And with this being the case, then the insulation layer which results in Schreiner et al. will have depressions where the inner electrodes are positioned, so that the insulation layer will not have the smooth surface as would be the case for the structure as recited in applicant's claims.

And an even greater difference exists between the structure of Schreiner et al. as compared to applicant's in that, according to their disclosure **there will be no insulation over the inner electrodes** of Schreiner et al. This fact is shown by Schreiner et al. in figure 3. Schreiner et al. never, nowhere in their disclosure, include mention of insulation which will cover the inner electrodes.

As opposed to this, claim 9 recites that an insulation layer is **added** before sintering. While this is a limitation which is couched in terms of a process, it nevertheless is a limitation of the claim. And this limitation, even though couched in the form of a process step, results in structure which is not in any way disclosed by Schreiner et al. This process step of coating the stack with material which is recited to be comprised of the same material as the piezoelectric

layers, and doing so before sintering, leads to an insulation layer which coats the entire outside of the stack except for where the outer electrodes are to be placed, including over the edges of the inner electrodes. Schreiner et al. has no electrical insulation over these edges of the inner electrodes.

The new claims 29-32 recite the invention in a different format, commonly referred to as a product-by-process format.

If the examiner can show the product which will result from the recited process is taught by one or more of the references, he may have a valid rejection. However, in the present instance, that this is not the situation. Certainly not with regard to the presently cited prior art.

None of the cited prior art, not even Schreiner et al., teaches an apparatus which has a piezoelectric stack, which also has a coating which consists of the **same material** as the piezoelectric material as the piezoelectric layers themselves, with this structure being created prior to sintering the stack as recited in claim 29. Schreiner et al. may well sinter their stack and thus obtain a sintered skin on the outside of their piezoelectric layers, see for example Schreiner et al. at the last two lines of paragraph 21. But this leaves the problem that the electrodes 11 of Schreiner et al. will never be covered at their edges. Schreiner et al. never recites adding any coating to the stack, and especially never recites that any such coating is sintered. In view of this, the structure of Schreiner et al. is not the same as will result from the process recited in claims 29-32. The product which will result from the process of these claims will have an insulating coating over the edges of the inner electrodes. **Schreiner et al. does not have this structure.**

Claim 30 goes on from claim 29 to recite that the structure is sintered after a layer of the

piezoelectric material is used as the coating. Again, the cited prior art, and especially the reference to Schreiner et al., does not teach this structure. While Schreiner et al. do indicate a sinter skin 17, the reference never makes clear what this skin is made of. If in fact, as has been assumed by the examiner, it is the same material as the layers themselves, the sinter skin will not be smooth as recited in claim 30, and it will not cover and insulate the edges of the inner electrodes. Since Schreiner et al. makes no mention of any coating, if the piezoelectric layers are sintered, at the internal electrodes there will be rough edges rather than the coating being smooth as recited in claim 30, and these inner electrodes will not be insulated as will be the structure which results from applicant's claims 29-32.

Claim 31 goes on to add that after the coating is sintered, portions of the sintered coating are removed. Again, it is clear that the reference to Schreiner et al. does not teach this structure, since there is no teaching in Schreiner et al. of coating the piezoelectric stack with material which is the same as the material of the piezoelectric layers. And further, in the last 4 lines of paragraph 6, Schreiner et al. disclose that any removal of the sinter skin, whatever it happens to be made of, is done before sintering so as to make removal easier. Clearly, Schreiner et al. do not teach the structure which is recited in claim 31.

Claim 32 goes on to add that after portions of the coating have been removed, outer electrodes are added. Here again, since it cannot be determined exactly what the sintered skin of Schreiner et al. is made of, it cannot properly be said that the structure taught by Schreiner et al. is the same as recited in applicant's claims.

The Commissioner is authorized to charge payment for a one month extension of time, or any other necessary fees in connection with this communication, to Deposit Account Number 07-2100.

For all of the above reasons, taken singly and/or in combination with each other, entry of this amendment and allowance of the claims are courteously solicited.

Respectfully submitted,

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